

CLAIMS:

1. An image processing method of detecting tag points in a current tagged image of a sequence of tagged images, comprising the steps of :

in the current image, estimating points which have optimal intensity values in intensity profiles and labeling said points as candidate points of a tag ;

5 using a previously constructed predicted image constituted by predicted tags determined from tag equations of a preceding image of the sequence and from spatial and temporal parameters ; and,

10 in the current image, detecting tag points among said candidate points from said previously constructed predicted image ;

15 determining tag equations for the current image from said detected tag points ; using said tag equations in the construction of a further predicted image for processing a next image of the sequence.

2. An image processing method as claimed in Claim 1, wherein the step of
15 determining tag equations from detected tag points uses a rational approximation the detected points, said rational approximation being used alone or in combination with a further approximation using a Residue Technique.

3. An image processing method as claimed in one of Claims 1 and 2, wherein the
20 step of detecting tag points from said previously constructed predicted image, comprising the sub-steps of :

25 distinguishing two kinds of tags : negative tags corresponding to minimum magnetization and to maximum intensity in the intensity profile, and positive tags corresponding to maximum magnetization and to minimum intensity in the intensity profile ;

distinguishing two kinds of candidate points : candidate points being optimum value points corresponding to maximum intensity in the intensity profile, and candidate points being optimum value points corresponding to minimum intensity ;

selecting points of a negative tag D as being the candidate points corresponding to the maximum intensity, which are situated between the two predicted

positive tags surrounding the predicted negative tag that corresponds to the negative tag D, and

symmetrically selecting the points of a positive tag.

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4. An image processing method as claimed in one of Claims 1 to 3, wherein the step of constructing a predicted image comprises sub-steps of :

choosing a given number of privileged points on tags of the preceding image of the sequence ;

calculating, from positions of said privileged points on, at least the preceding image of the sequence, a predicted position of said privileged points ; and

constructing predicted tags of the predicted image from predicted positions of said privileged points.

10 5. An image processing method as claimed in Claim 4, wherein the step of
15 constructing predicted tags from predicted positions of said privileged points comprises sub-steps of :

estimating a function (f) that minimizes the distance between the predicted positions of privileged points and the result of the application of this function f to these privileged points ;

20 applying said function (f) to tag equations of the preceding image of the sequence to construct the predicted tags of the predicted image.

25 6. An image processing method as claimed in Claim 5, wherein the function (f) is a similarity expressed as $f(z)=lz+c$, where l and c are complex parameters.

JF AL 7. An image processing method as claimed in one of Claims 4 to 6, wherein
privileged points are intersections between tags obtained from an MRI image tagged in a grid pattern in two different directions or between tags obtained from two MRI images each tagged in a straight and parallel line pattern in one direction different from the tagging direction of the other, said two MRI images corresponding to a similar step of the sequence, said intersections being calculated based on the tag equations.

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8. An image processing method of one of Claims 1 to 7, to be applied to, at least, a sequence of MRI tagged images, to track tags on successive images of the sequence, comprising steps of :
5 initializing the processing method by implementing one of the methods of Claims 1 to 7 for the first image of the sequence, using a first predicted image which represents the non-deformed modulation pattern ;
iteratively implementing the image processing method of one of the claims 1 to 7 for the following images of the sequence.

10 9. A computer program product comprising a set of instructions for carrying out one of the methods as claimed in Claims 1 to 8.

10. A system for processing images of a sequence of MRI tagged images, comprising :
15 means for detecting tag points of these images according to a method as claimed in one of Claims 1 to 8 ;
means for displaying the results as a succession of images wherein tags are visible.

20 11. An MRI apparatus comprising :
means for acquiring sequences of MRI images from a site in a body ;
processing means including a system as claimed in Claim 10.